Using Ontologies to Harmonize Warfighter Data Exchanges

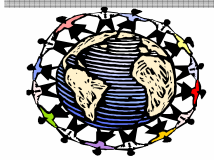
SSTC 2006

U.S. Army Software Engineering Center

MISSION - OBJECTIVES

Facilitate the execution of the Army Data Strategy by providing users with common and overarching data products and services to promote interoperability and faster access, retrieval, analysis and utilization of data.

Migrate from Development/CM of Messaging Standards to development of common data products for the Army Warfighter and ensure interoperability with Joint, Inter-agency, and Multinational (JIM) communities.



COI Administration

Data System Engineering

Data Modeling& Products

Data Validation & Test Support

Configuration Management & Control

Data Interoperability

Blue Air
FAAD
PATRIOT
ADSI
(HAWKEYE)
(AWACS)

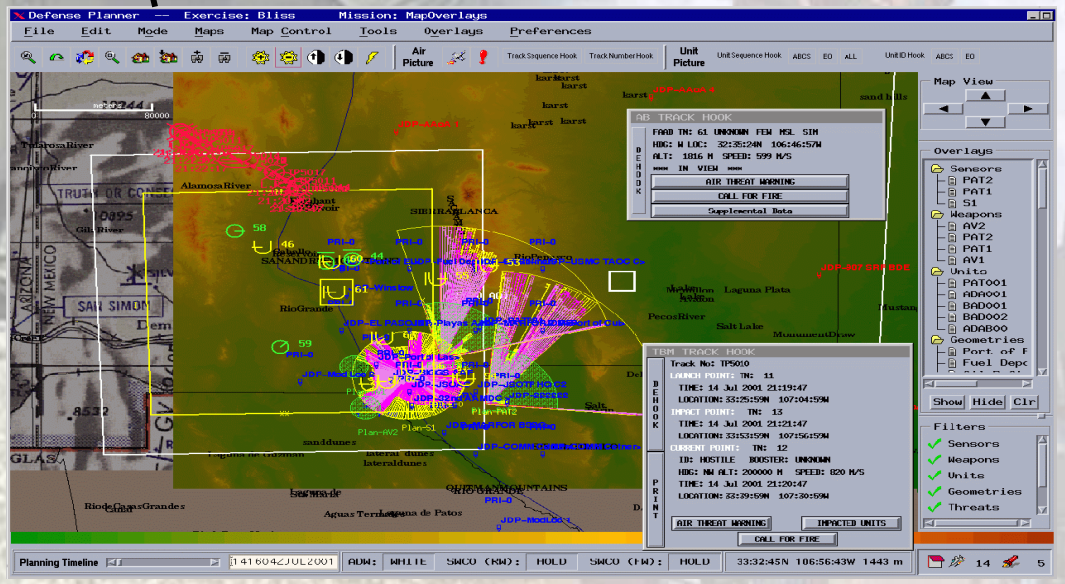
THREAT WARNING
ABCS
(USMTF)

AIR SITUATION
ABCS
(PASS)
(AMDDS)

BATTLEFIELD CONTROL MEASURES
FAAD
ABCS
(PASS)
(USMTF)
(VMF)

COMBINED ARMS UNITS
MANEUVER
AIR DEFENSE
FIELD ARTILLERY
FBCB2

THEATER MISSILE DEFENSE
ADSI
(JTAGS)
(TIBS/TDDS)



IMAGERY
DTSS
NGA PRODUCTS
UAV FEED

RED AIR
FAAD
PATRIOT
ADSI
(HAWKEYE)
(AWACS)

INTELLIGENCE
ASAS

BLUE GROUND
ABCS
(PASS)
MCS
AFADTS
(USMTF)

ARTILLERY
AFATDS
(D210)

TASK ORGANIZATION
AIR DEFENSE
AVIATION
MANEUVER
COMBAT SUPPORT
FIELD ARTILLERY

JOINT INTERFACES
- AIR FORCE
+ JDP
+ TBMCS

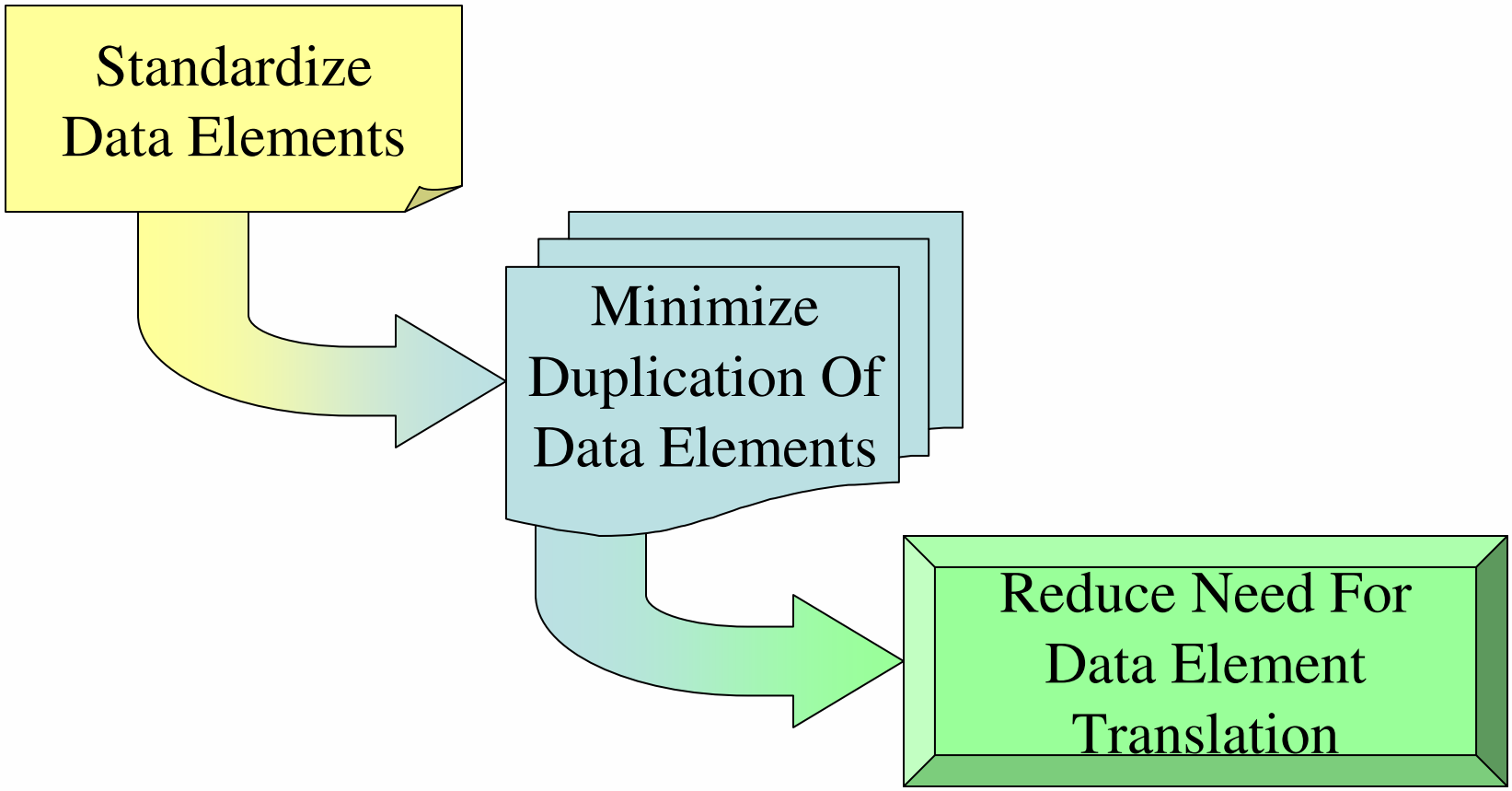
NATIONAL MISSILE DEFENSE
COMMAND & CONTROL
BATTLE MANAGEMENT COMPUTER (C2BMC)
(MISSILE DEFENSE AGENCY)
(INTER-AGENCY)

WARGAMING / SIM
CBS
WARSIM

COALITION
SURFACE-TO-AIR MISSILE
OPERATIONS CENTER (SAMOC)
(GERMAN)
(MULTI-NATIONAL)

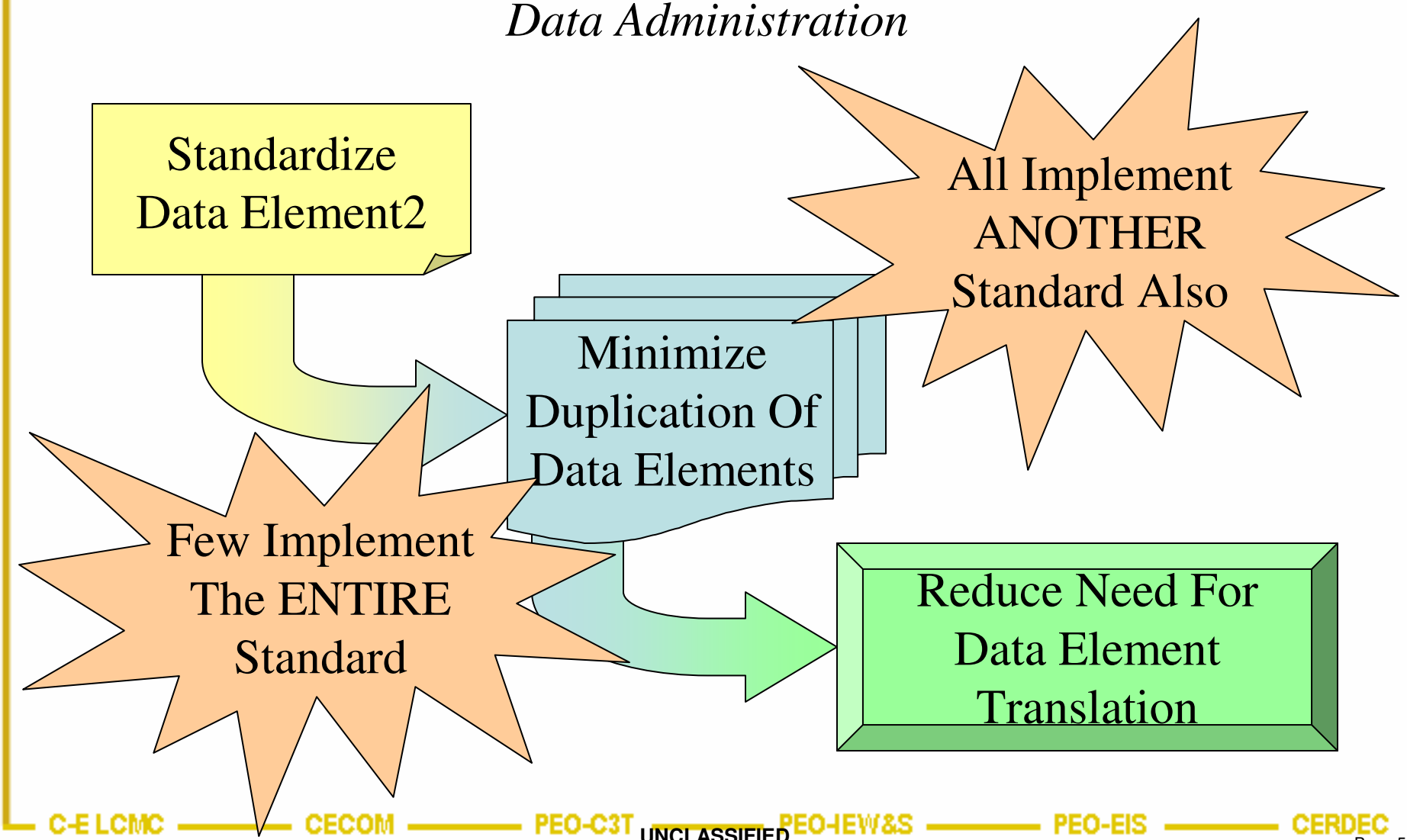
Traditional Approach To Data Interoperability

Data Administration

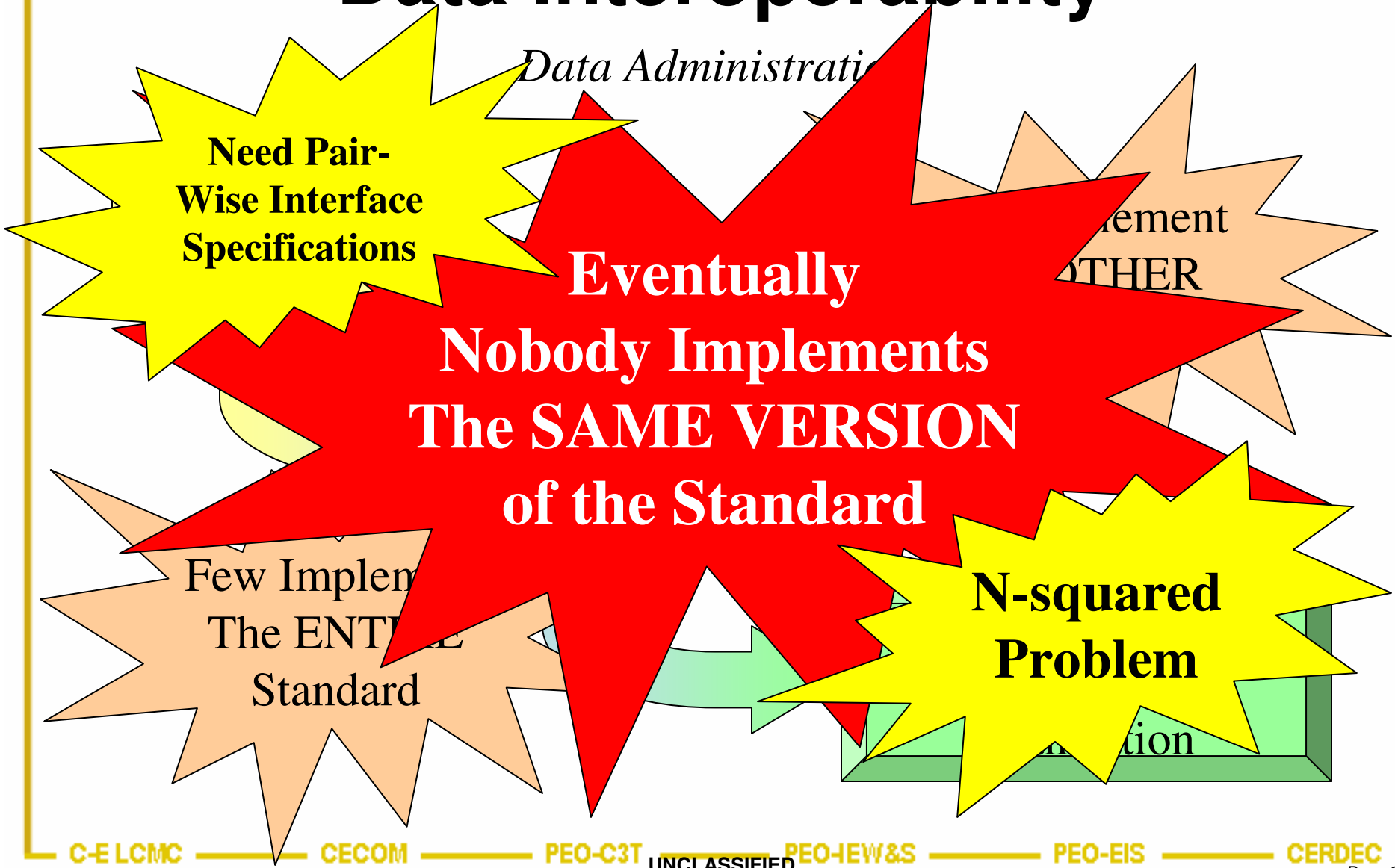


Traditional Approach To Data Interoperability

Data Administration



Traditional Approach To Data Interoperability



A New Approach

Interoperability without pair-wise interfaces

- Focus on **visibility** and **accessibility** of data
- Recognize the need for data **usability** by unanticipated users/applications
- Improve **flexibility** in data exchange

GOALS

1. Increase the amount of data available

2. Ensure that data is understandable

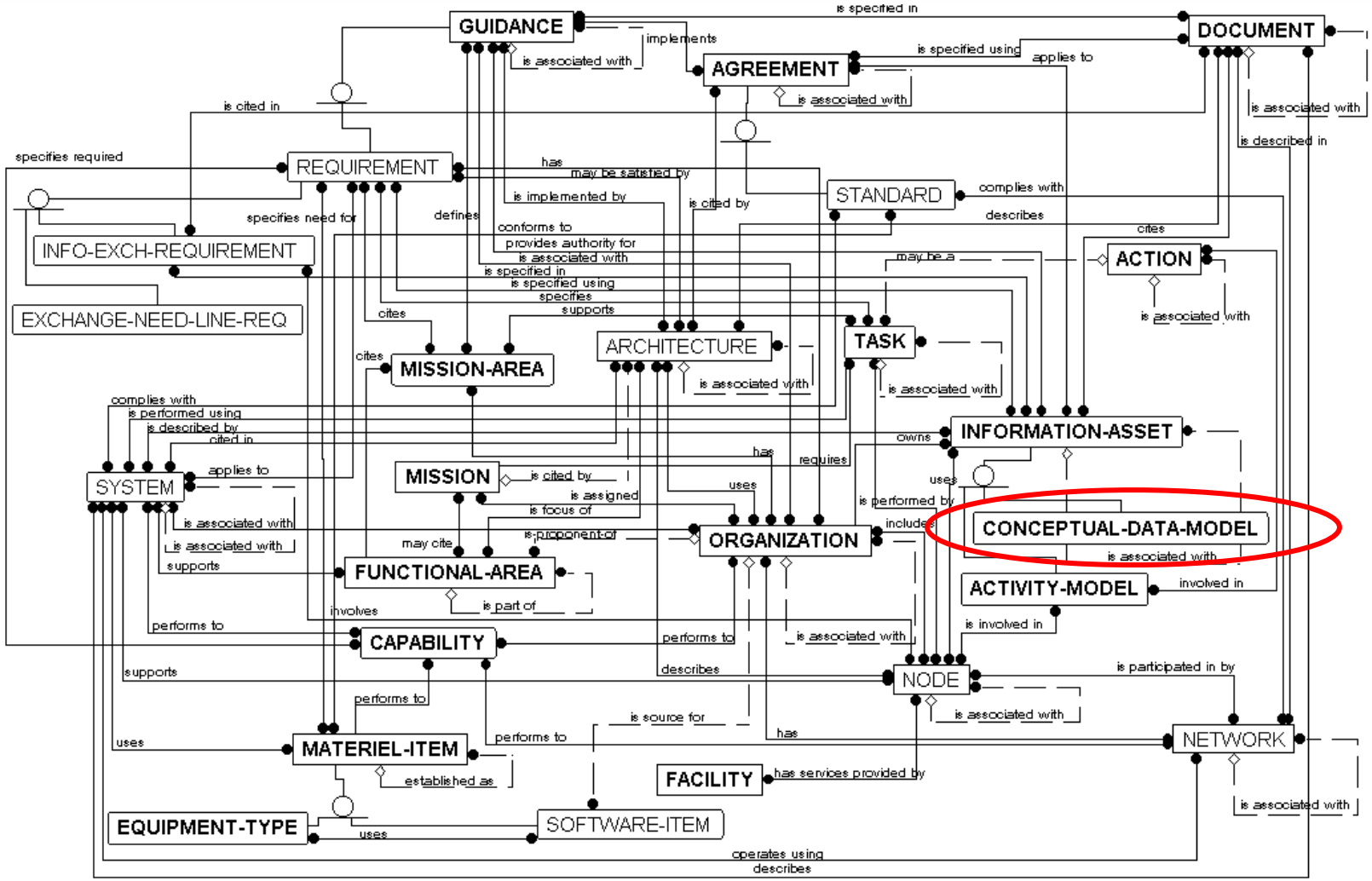
Some Basic Terminology

- Taxonomies – Simple tree-like semantics
- Thesauruses – More complex term semantics
- Conceptual Models (e.g., Ontologies)
  - Entities
  - Relationships
  - Attributes and Values
  - Rules

Ontologies organize metadata to enable automated visibility and accessibility

CADM

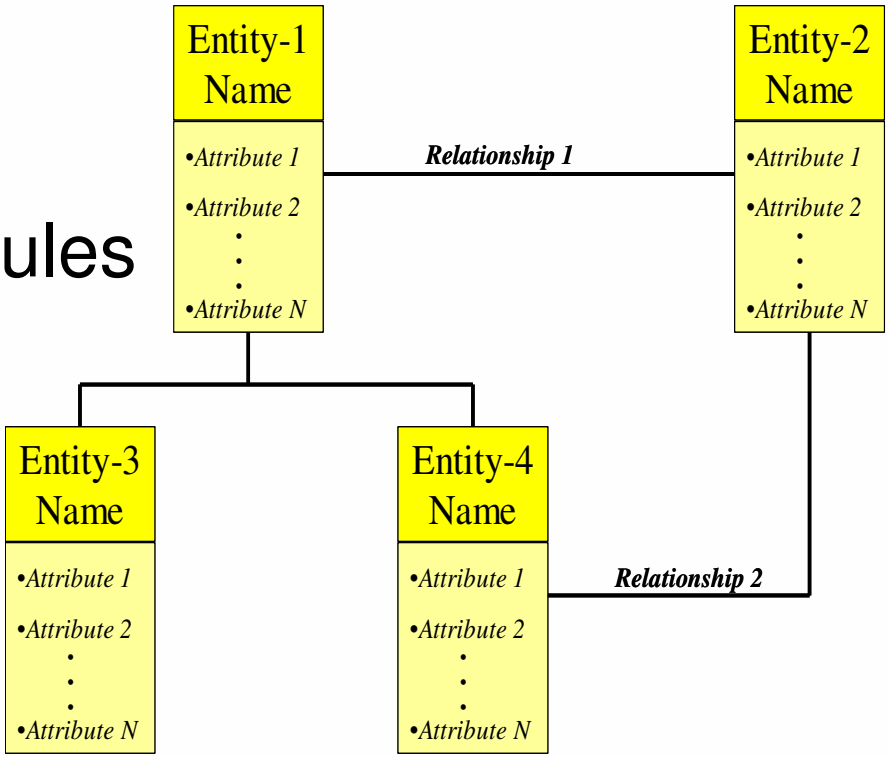
Core Architecture Data Model



NOTE: DoD standard entities are shown in bold font.

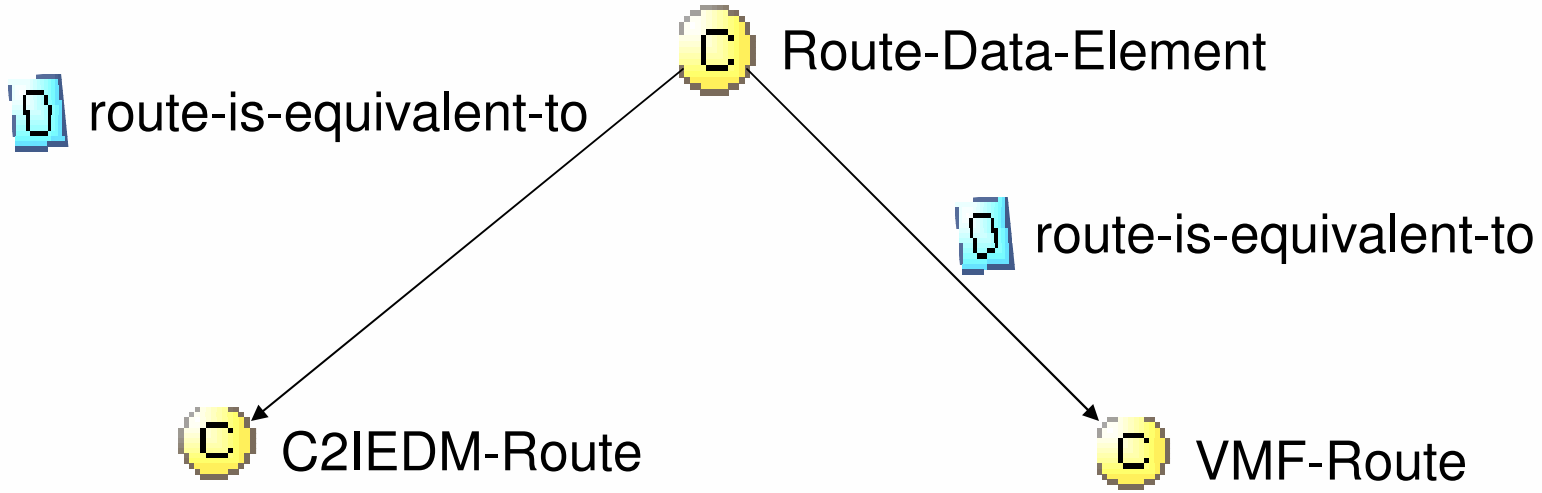
Logical Data Model (OV-7)

- Describes
  - Data Requirements
  - Business Process Rules



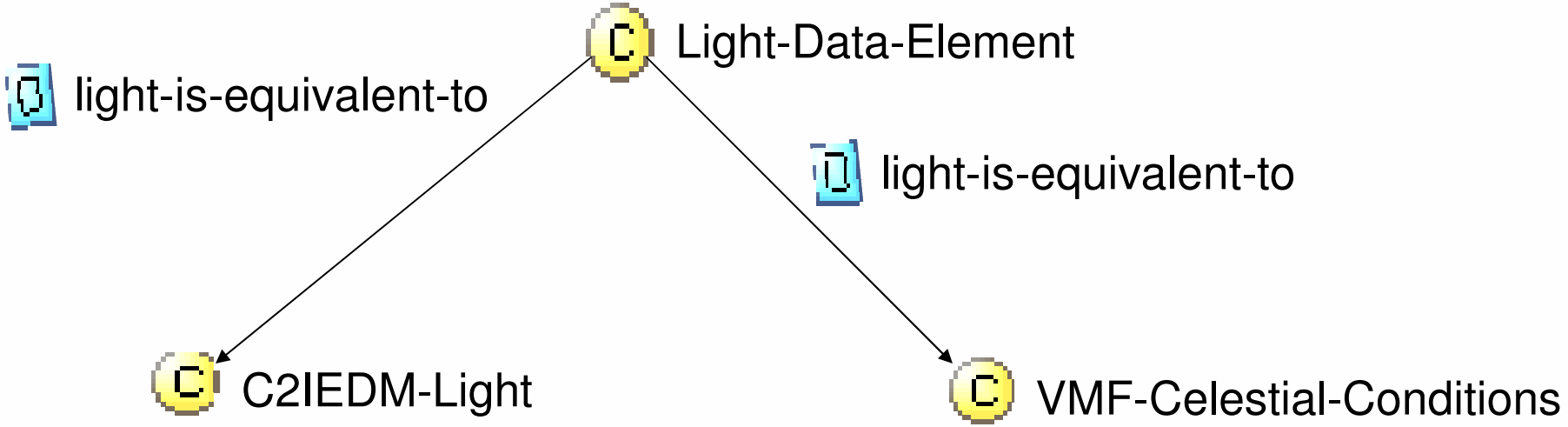
- Highlights shared data syntax and semantics

C4ISR Data Ontology
Common Concepts



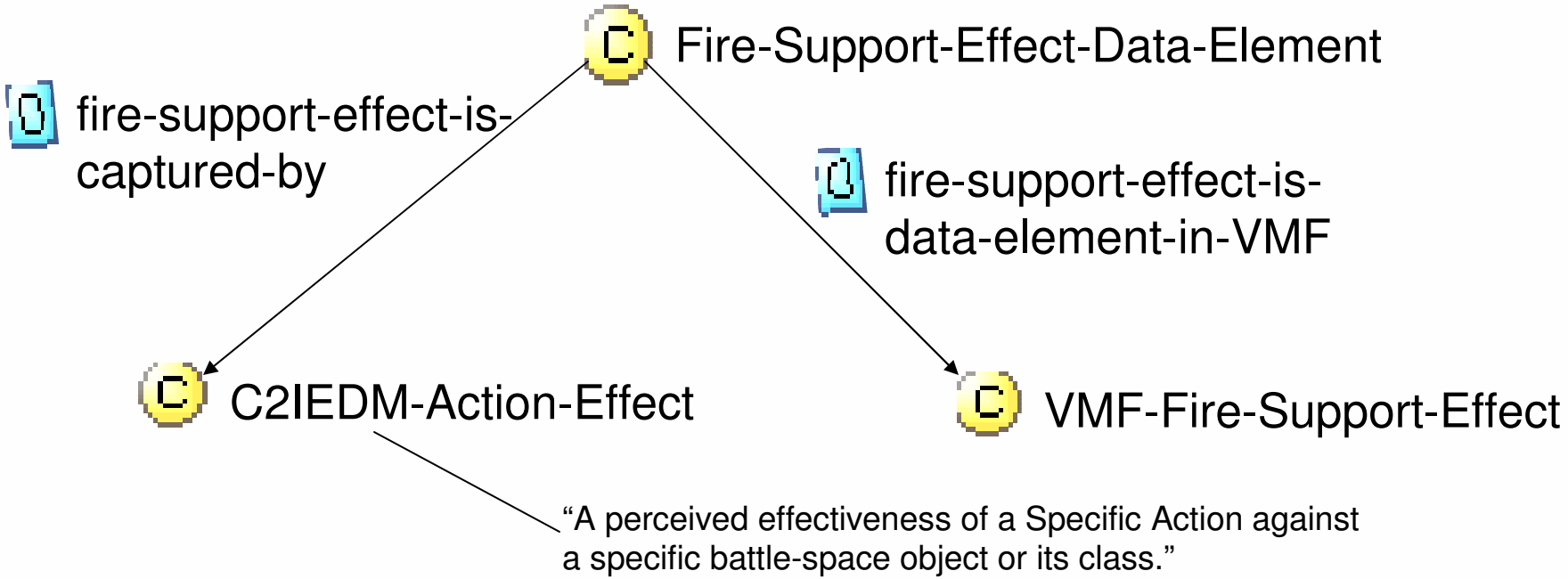
Route: A line of travel. An established or selected course of travel or action.

C4ISR Data Ontology
Common Concepts



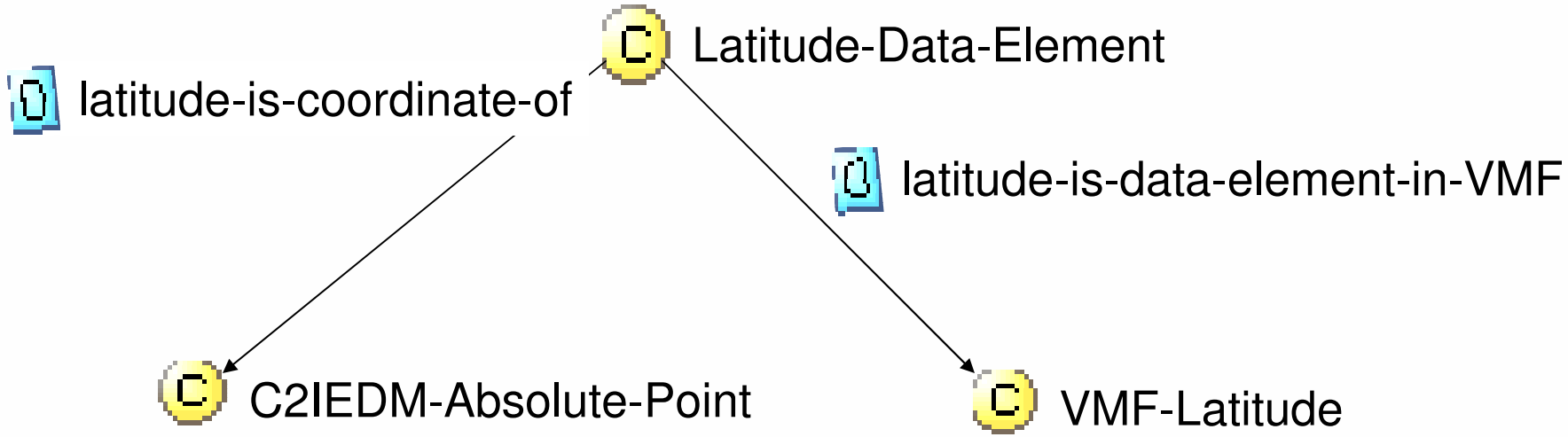
Light: An electromagnetic radiation, visible to the human eye, traveling in a vacuum with a speed of about 186,281 miles (300,000 kilometers) per second.
A celestial body is a source of light.

C4ISR Data Ontology
Common Concepts



Fire-Support-Effect: Indicates the result or effect of firing weapons (as firearms, artillery, or missiles) on a defined target.

C4ISR Data Ontology
Related Concepts



Latitude: Angular distance from some specified circle or plane of reference. Specifically, angular distance north or south from the earth's equator measured through 90 degrees.

DoD Net-Centric Data Strategy

Core Layer

- Security Descriptors
- Resource Descriptors
- Summary Content Descriptors
- Format Descriptors

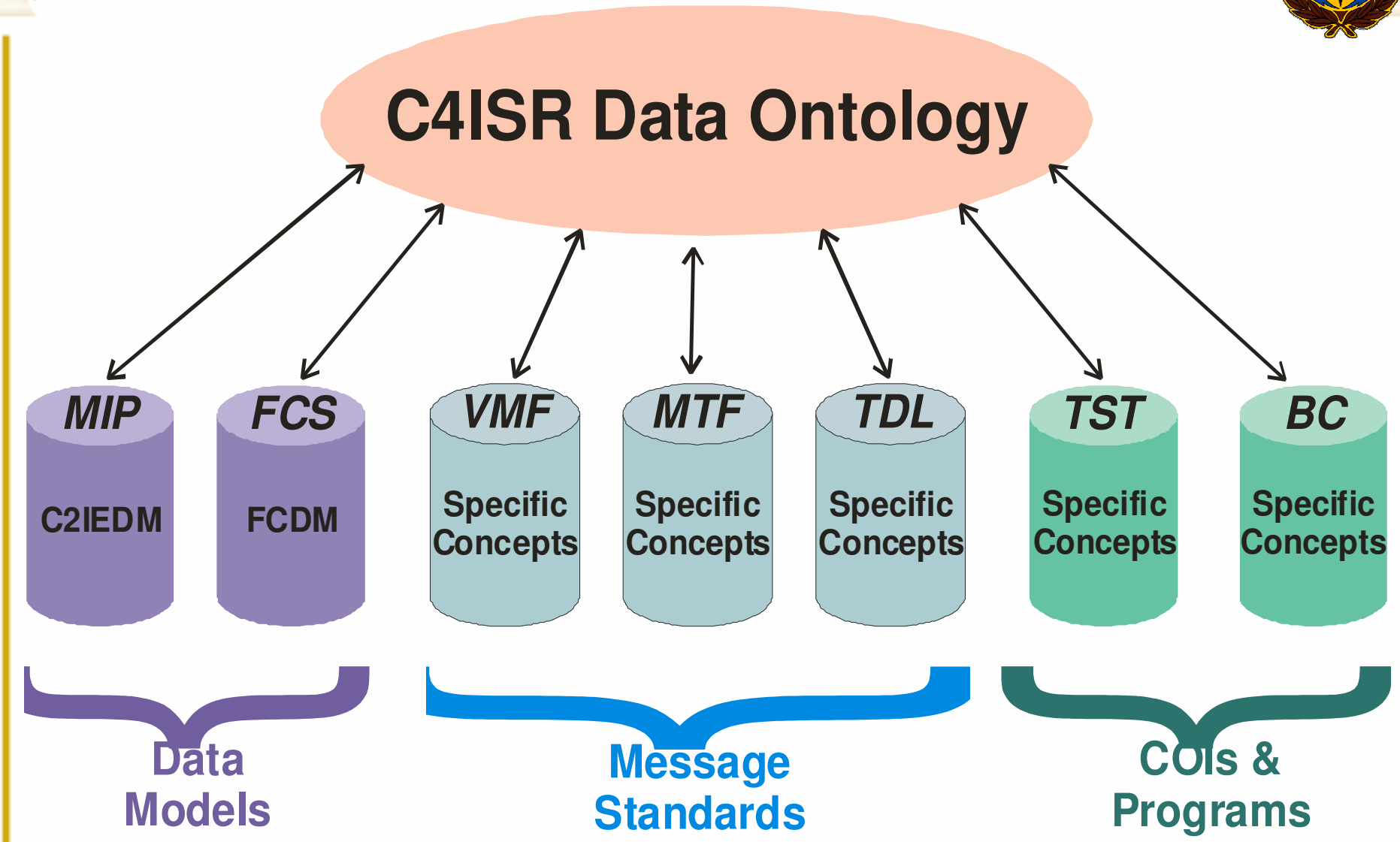
+

Extensible Layer

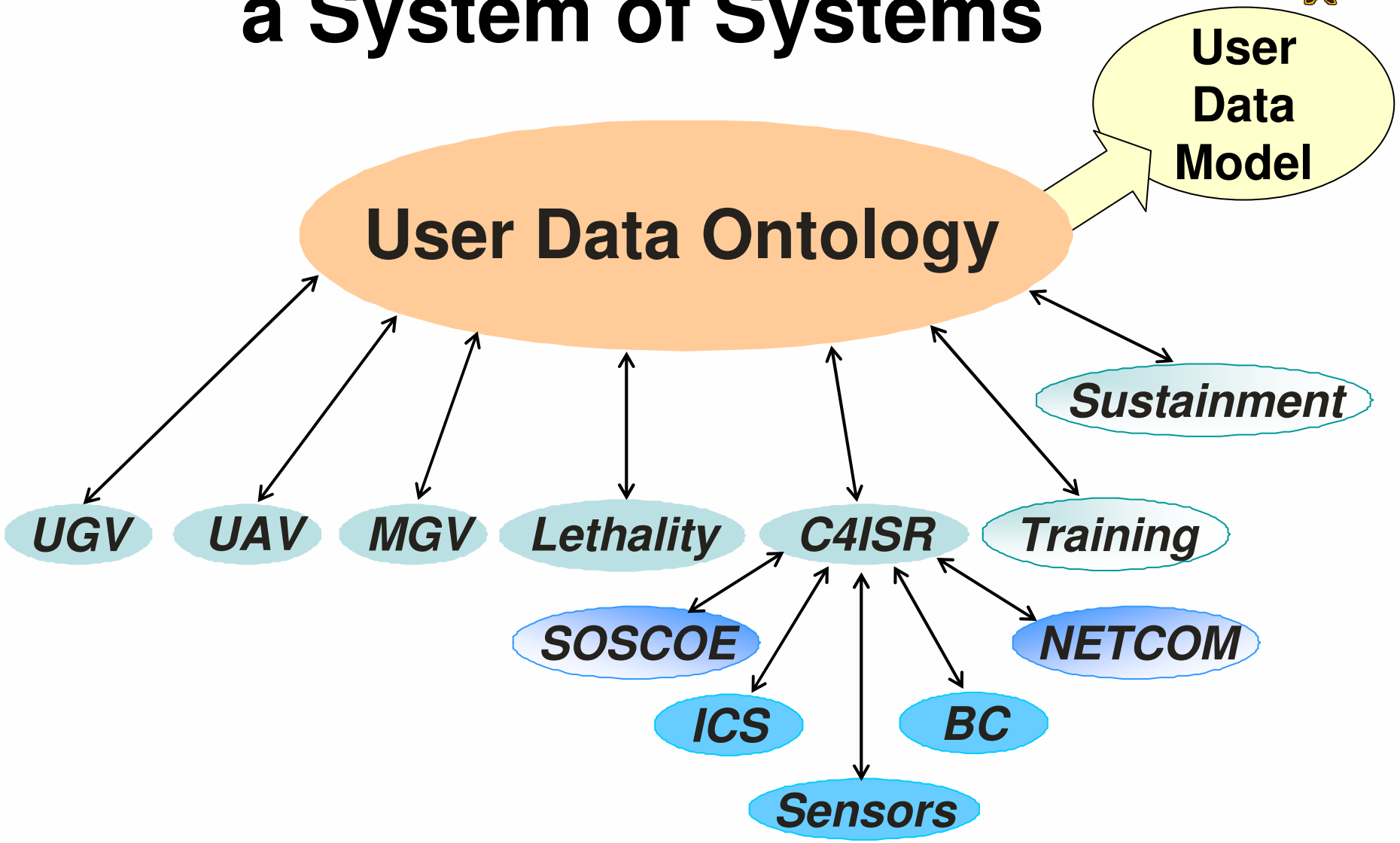
COI/Domain specific descriptors

Provides ability to define mission-specific metadata fields

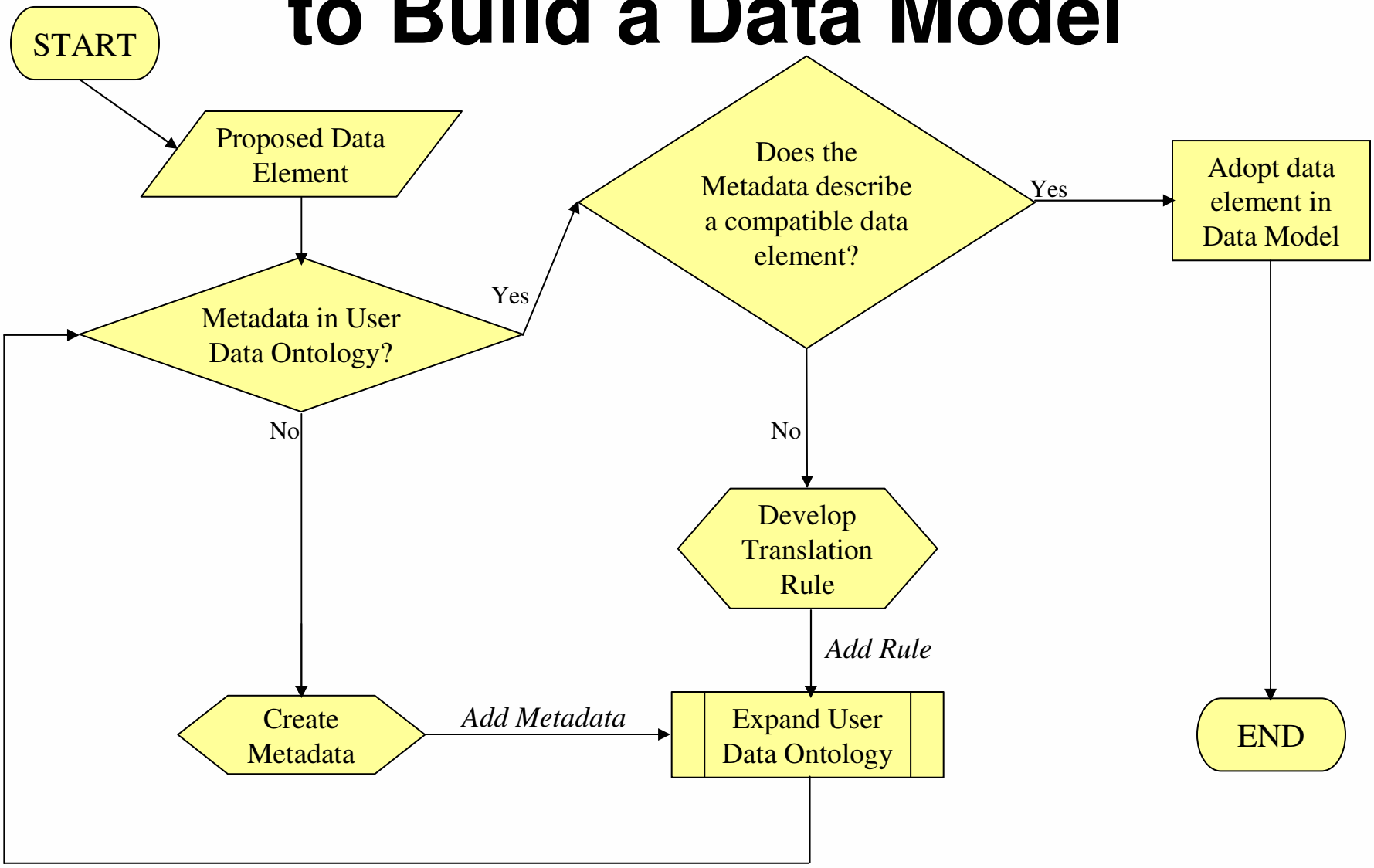
Can extend any of the core layers as needed


C4ISR Data Ontology
MIP
C2IEDM
FCS
FCDM
VMF
Specific Concepts
MTF
Specific Concepts
TDL
Specific Concepts
TST
Specific Concepts
BC
Specific Concepts
Data Models
Message Standards
COIs & Programs

Harmonizing Data Within a System of Systems



Using a User Data Ontology to Build a Data Model



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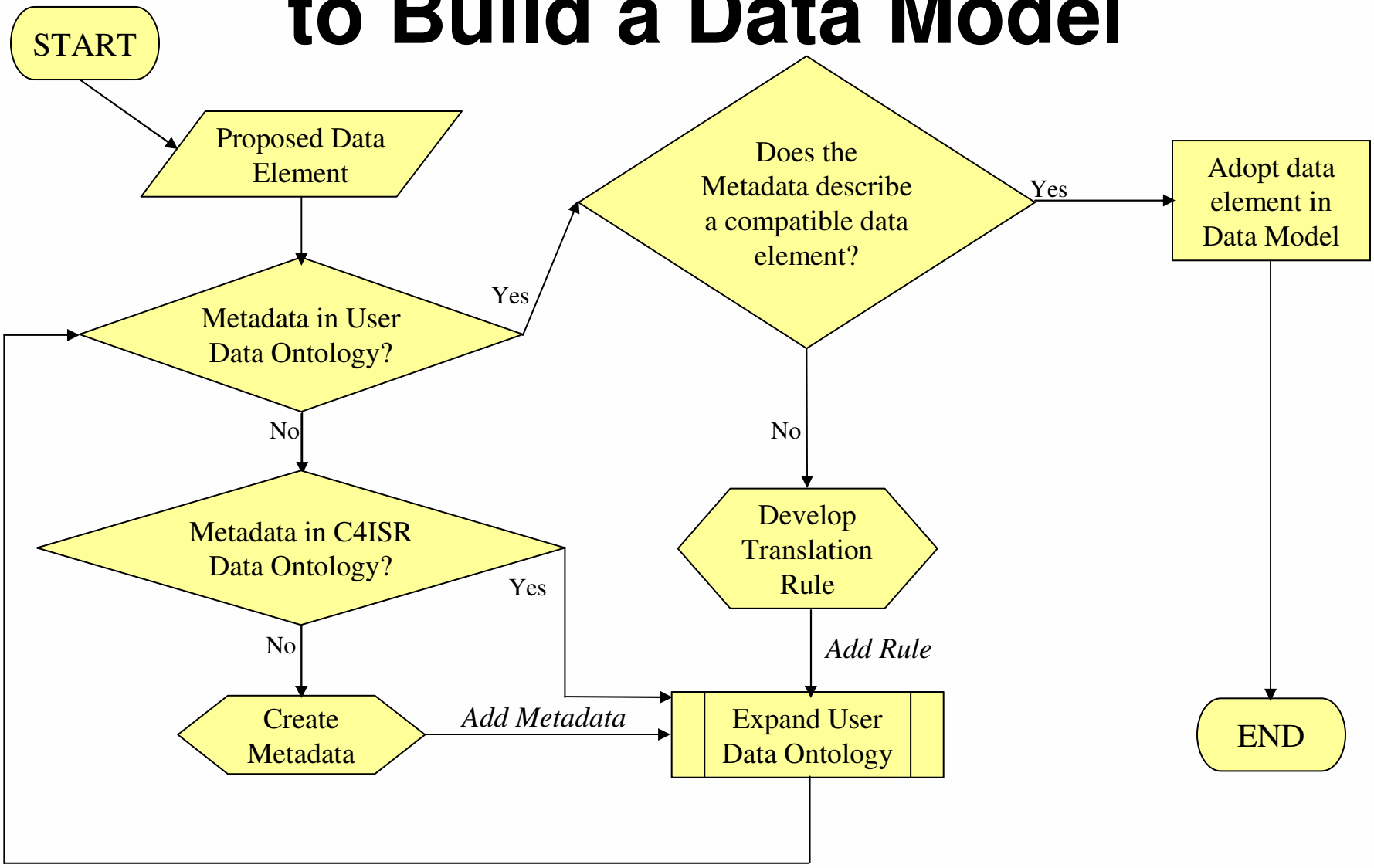
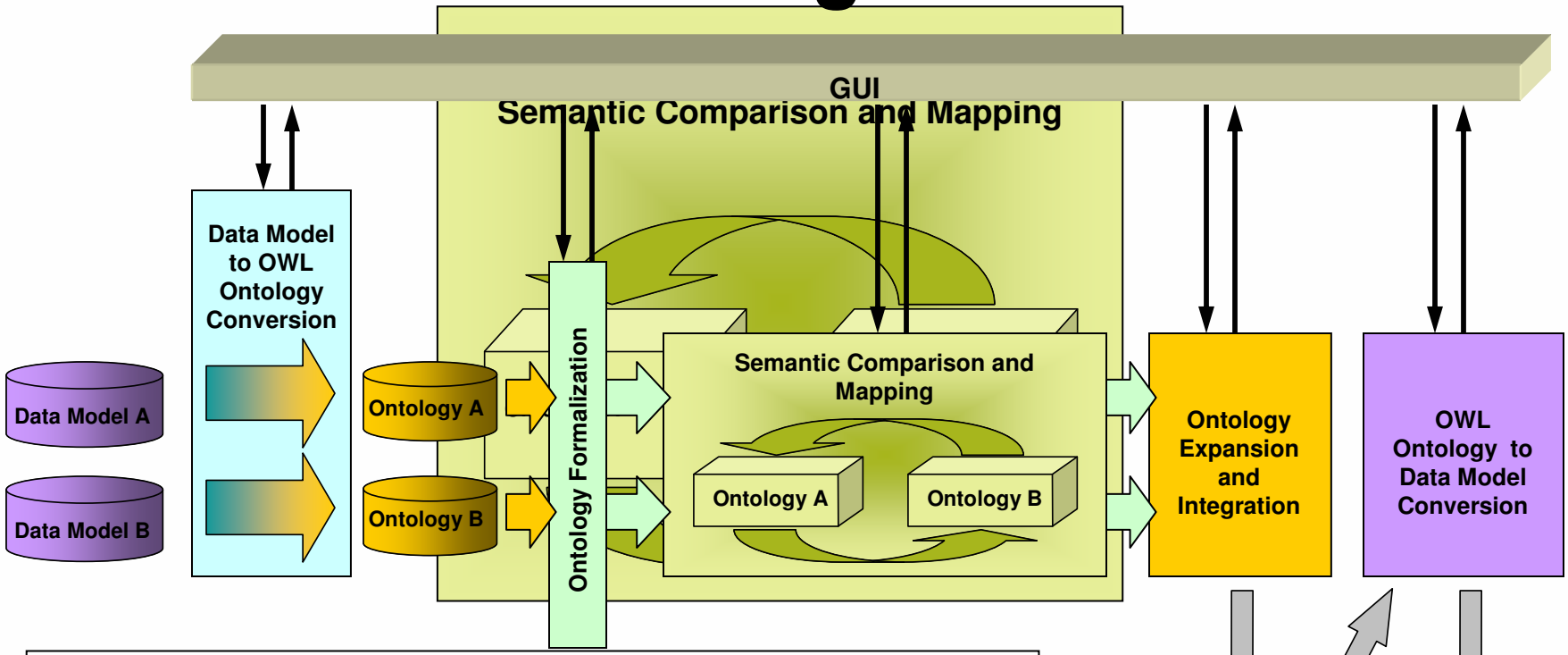


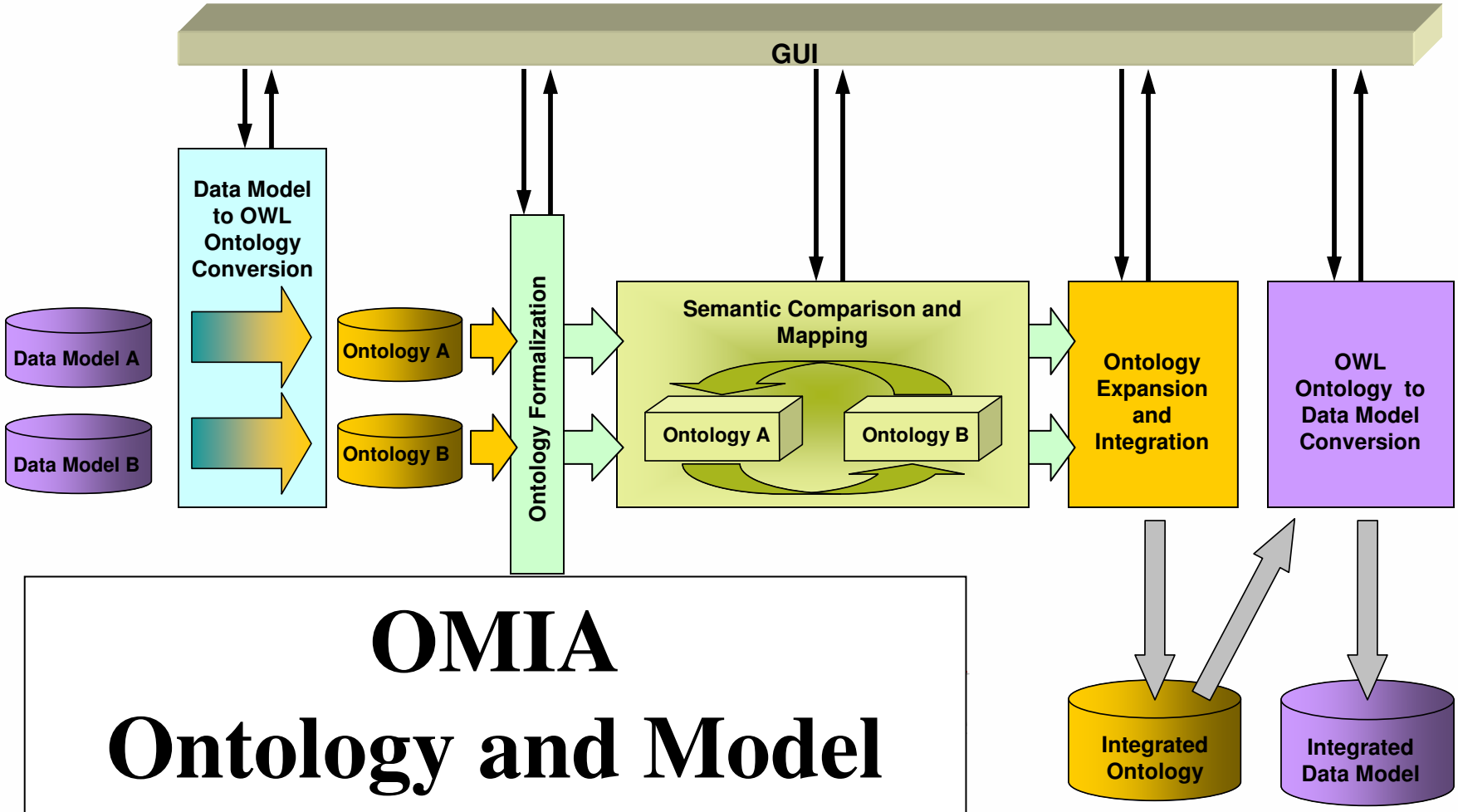
Institutionalizing the Process



OMIA

Ontology and Model Integration Application

Institutionalizing the Process



OMIA

Ontology and Model Integration Application

Net-Centricity Demands a Global Perspective

- Enabling Rather Than Constraining Methods
- Scalable Information Architectures
- Supportive XML-Based Technology
  - Multi-use
  - Growing Inventory
- Innovative, Visionary Engineering

Additional Information

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C4ISR Data Ontology

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